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CONTENTS

Page

Wildlife
- Game as Food 1
- Tarsiers in Sulawesi 7
- Wild Asses in Kutch 29

Management
- Wildlife versus Nomadic Stock 8
- Gunung Mulu Survey 16
- Ecological Guidelines Part II 18

Conservation
- Marine Conservation in Tonga 14

Law
- Trends in International Environment Law 23

News from IUCN/SSC Asian Elephant Group 25

Notes
- India — Wolves 32
- India — Wild Dogs 33

Front cover: Indian Wild Asses.

Back cover: Orang utan (Rijksen)

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GAME AS FOOD

by Antoon de Vos

For three million years or more man has been eating wildlife of various kinds. Primitive man harvested a great variety of wild animal foods, as is evidenced by the many species of mammals, birds, reptiles, amphibians, fish and also invertebrates which are still being collected today by the Kalahari Bushmen and the pygmies of the African tropical forest zone.

Primitive people must have been largely opportunistic in their food habits, although they must have been subject to certain taboos and food preferences as well, which is still true today.

Evidence obtained by anthropologists in various parts of the world indicates that primitive man already had certain preferences in his use of animal protein.

In Africa an amazing variety of wildlife species are eaten, including all wild ungulates, primates, hyraxes *(Hyracoidea),* rodents, all cats and many species of birds, reptiles and amphibians. A long detailed list of wild mammals, birds and reptiles used as food in Africa was prepared by Jardin (1970). The utilization rate of monkey in west Africa is high, so much so that the continued existence of some of these species is endangered by this practice (Asibey, 1974). Chimpanzees and pigmy-chimpanzees are also eaten in some west African countries. Monkey flesh is often preferred to other meat, as indicated by high prices on local markets.

Bushmeat in west Africa

A wide range of animals currently provide edible meat in west Africa. Among the mammals, rodents and antelope play an important role and among the latter duikers (*Cephalophus* spp. and *Sylvicapra* spp.) and bushbuck *(Tragelaphus)* make an important contribution to the diet. In the past apparently a smaller number of animals was used for the daily human diet, because these people could afford to be more selective in their food habits. Bush babies (*Galago* spp.) and African hedgehogs (*Atelerix* spp.) have become important food items only recently.

Virtually all species of wildlife – mammals, birds, reptiles, and invertebrates – serve as sources of wild meat in Ghana, as is the case in many other countries. The most popular are the rodents and certain wild ungulates. Rats, cats and dogs may occasionally also "pass" for game (Clottey, 1968).

In some parts of Ghana, as much as 73% of locally produced meat may come from wild animals, particularly from some of the smaller types such as grasscutters (*Thryonomys* spp.), hares (*Lepus* spp.) and giant rats *(Cricetomys gambianus).*

Detailed recent statistics on the harvest from various sources are available for Botswana (von Richter, 1976): in 1975, 43,187 head of game were sold and 14,630 were shot. Since, with the exception of leopard, lion and ostrich, these are all large to medium-sized ungulates, this represents a vast quantity of meat. In 1971 there were 325,532 head of game, again mainly ungulates shot by safari and non-safari hunters in Botswana.

As already noted, rodents form a significant portion of the total amount of bushmeat consumed, particularly in west Africa. The use of rodents as food in tropical Africa was reviewed by den Hartog and de Vos (1973). However, this use is not always adequately reflected in statistics, as food consumption surveys generally record all foods obtained by hunting or trapping indiscriminately under the heading of "bushmeat" in English or *gibier* in French. Generally these figures also do not include the small animals which are collected by children. Therefore, the few statistics that are available record minimum figures only.

Rodents may be of greater importance for human consumption in many rural areas than the bigger animals. This is because:

– They generally do not come under the game laws and can therefore be harvested continuously.

– The high turnover rate allows for a high sustained yield without depletion of the populations.

– Rodents are very numerous in relatively densely populated areas where larger animals are scarce.

Among the rodents, two forms are widely consumed, particularly in West Africa: the giant rat, and the cane-rat or grasscutter.

Another very valuable rodent is the springhare *(Pedetes capensis forster)*, which is widely distributed throughout southern Africa. This rodent, which may breed continuously and reaches an adult weight of 2.7-3.5 kg (Butynski, 1973) has been the subject of some interesting statistics about its use in Botswana. Butynski estimates that the total number killed by

Grey Duiker

Bushmen is more than 346,000 annually and that the number killed by Botswana hunters amounts to 2.2 million per year. This represents a total of 2.2 million kg of springhare meat every year, the equivalent to the amount of meat obtainable from 20,000 head of cattle.

Rodent meat can be purchased in many cities and towns in West Africa. Insofar as can be ascertained, of all African rodents only the grasscutter and the palm squirrel have been analysed for their food composition (Bergeret *et al.*, 1957). No information is available on the biological value (BV) and the net protein utilization (NPU) of rodents. The chemical score of rat meat is in the same range as that of other foods of animal origin (den Hartog and de Vos, 1973).

Unfortunately, far less quantitative data on the use of wildlife for human food are available for South America than for Africa, but particularly in the forest zone and to a lesser extent in the savanna zone this is still considerable. Most primitive Indian tribes base their animal protein intake almost exclusively on wildlife, and settler communities also make considerable use of this resource (Smith, 1976).

Amazonian fauna has historically been important as a source of food. Birds, monkeys, turtles, fish, manatee, deer, paca, peccaries, capybara, tapir, sloth, ants and grubs are only some of the animals mentioned in the literature as having been eaten and still used as food in Brazil today.

Smith (1976) assessed the importance of wild meat in the diet of settlers in rain forest and second growth areas along Brazil's Transamazon Highway. He considers his data biased in favour of larger species since settlers are less likely to report smaller game. During a 12-month period in 1973/74, a total of 3,214 kg of game was taken within a 100–km^2 hunting area of Agrovila Nova Fronteira. Allowing for an average weight loss of 40%, the actual amount of game meat consumed was about 1,929 kg or an estimated 5 grams of protein intake per day. During a similar 12-month period of observation in 1973/74 in the vicinity of Leonardo da Vinci, a total of 3,389 kg was taken, or an estimated 2,033 kg consumed. This supplied about 20% of the protein requirements of the community.

Instead of cropping more abundant mammals, such as rodents and marsupials, settlers in forested areas concentrate on relatively large taxa such as peccary, tapir and brocket deer, composing 89% of the game take by weight in the vicinity of Nova Fronteira and Leonardo da Vinci. Only when the larger species become scarce in heavily hunted and modified habitats are rodents significantly represented in the annual kill. Thus pacas and agoutis account for 39% of the game taken around Coco Chato, where the habitat has been degraded, while rodents account for only 3% of annual game take by weight in predominantly forested areas. However, rats and mice, a source of food for some aboriginal groups, are not eaten by the colonists.

Wild birds, a minor source of animal protein to

colonists in the study areas, account for only 0.6% of the yield by weight in forested areas and 2.6% in the vicinity of Coco Chato.

FAO (1969) reported that in the Ucayli region of the Amazon fish and wildlife accounted for about 85% of the animal protein consumed by people in rural areas.

The capybara, a giant rodent weighing between 30 and 50 kg, has long been the object of intense exploitation. It occurs in large numbers over extensive areas of South America. In Argentina, capybaras are hunted everywhere for their meat and hides and several ranches in Venezuela raise them commercially.

A comparison of the production efficiency of capybaras and cattle has shown that the former are 3.5 times more efficient than the latter and also six times more efficient than the latter in reproductive performance under conditions prevailing on floodplain savannas. This permits off-take rates of about 40% without detriment to the productive potential (González Jiménez, 1977).

Cultural factors

Many cultural and religious factors exist in various parts of the world which prevent or inhibit people from using certain species of wildlife. However, these are often put aside by starving and desperate people.

Several societies forbid their members to eat a particular animal which, according to their legends, aided the group's original founders in one way or another and is, therefore, honoured. Several animals, including the cow and the monkey, are considered sacred by the Hindu religion and may, therefore, not be eaten.

Many animals are considered clan or totem animals and therefore may not be killed and eaten by members of a particular clan or a similar social group.

Certain wild animals may not be killed or touched because of formal religious dicta, traditional taboos or prejudices. Muslims, for example, do not eat pigs, scavengers and avoid eating hares, rats and mice.

Sex and age taboos in dietary habits may be rather pronounced. Quinn (1959), who made a detailed study of these habits among the Pedi people of South Africa, showed that among 37 species of wild mammals, 12 species or 32% could be eaten only by men and boys. Temporary avoidances of some rodent species are also sometimes prescribed. For example, in Senegal women are restrained from eating bush rats during pregnancy (de Garine, 1962) and in Cameroon among the Evodoula pregnant women avoid the consumption of palm squirrels (Masseyeff *et al.*, 1958). In some parts of Rhodesia the fat mouse is much consumed, but only by adults and not by children (Geifand, 1971).

In Brazil, settlers who feel ill generally avoid "strong" game, thinking it will provoke latent disease or exacerbate symptoms of a chronic illness. The origin of the food avoidances of Transamazon settlers is unclear, but many have undoubtedly been absorbed, in a modified form, from aboriginal cultures (Smith, 1976).

Some of the taboos or prejudices referred to are deep-seated and cannot be readily changed. Yet, education in the principles of nutrition and meat hygiene may gradually modify these views which may be rather ill advised in those areas where a scarcity of animal protein prevails.

Finally, some animals are thought to be of medicinal value and eaten when so required. For example, rats (*Rattus* spp.) are given to children in Ghana who are suffering from whooping cough (Asibey, 1974).

The data shown in the previous sections of this paper should convince even the most critical reader that wildlife is still an important source of protein for human consumption even when little or no effort is made toward the management of this resource. It is my contention, and that of others who have concerned themselves with this field (e.g. Talbot, 1966; Mossman and Mossman, 1976), that there are many areas in the world where livestock or agricultural production is slight but where wild animals could be utilized much more efficiently for food. In these areas high production of wildlife could be maintained on a sustained yield basis without adversely affecting the carrying capacity of the habitat. On such lands wild animals offer a greater potential for a sustained production of meat and other animal products than domestic stock. Evidence for this conclusion comes from comparisons between domestic livestock and wildlife. Wildlife is better adapted to prevailing ecological conditions, more able to utilize the available plant material and requires less water (de Vos, 1973). Wildlife species are also more suited to prevailing climatic conditions than most introduced stock. As detailed by Ledger (1963), the carcasses of wild animals contain far less fat than those of domestic stock. The production of lean meat is a more efficient use of fodder than is the production of fat. Consequently, in terms of meat production wild animals with virtually no fat make far more efficient use of the available vegetation than do domestic animals.

King and Heath (1975) have demonstrated that the species with the greatest potential in a semi-arid environment in Africa is the oryx. It is able to gain weight on forage that is below the capacity of maintaining cattle, and has half the drinking water requirements of dorper sheep and one quarter of Boran cattle

for contributing to man's well-being is much greater than is appreciated by specialists and government authorities dealing with food and nutrition.

It is especially true in developing countries that people who live in and on the countryside, or who live in cities and towns but maintain rural ways and tastes, give particular importance to the nutritional and the cultural value of their local wildlife foods. Such values, which are also among the important pleasures of daily life, should not be minimized or removed in the name of progress. Unfortunately, this is exactly what some food and nutrition specialists are inclined to do. Out of their own cultural prejudices they may minimize, or look down upon, or simply not see certain indigenous foods and ways of life. Instead, the specialists should be studying and making use of traditional foods and methods of food gathering. Better food and nutrition can often be achieved more rapidly and with greater local acceptance when the production or gathering methods of familiar foods are improved rather than by putting something strange on the table.

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FAO has published the first edition of a bibliography on wildlife and national parks management with regard to the Asia-Pacific region. TIGERPAPER readers who are interested to receive a copy are invited to write to the editor of TIGERPAPER, FAO Regional Office, Phra Atit Road, Bangkok 2, Thailand.

NEW DISCOVERIES ON TARSIER BEHAVIOUR IN SULAWESI

As part of Project 1527, WWF is supporting research and management in the 4,446 ha Tangkoko Batuangus Reserve in North Sulawesi. Dr. John MacKinnon, Dr. Kathy MacKinnon, and Ir. Tarmuji are supervising the development of the reserve, training local people, and surveying other suitable areas for eventual establishment of more reserves. With additional funding from the Wenner-Gren Foundation, the MacKinnons and their local field associates are also conducting essential research on various endemic species, since management activities must be based on a sound understanding of the ecosystems involved.

While all research is still in its early stages, the Tangkoko Batuangus team have already made some very interesting observations on animals as diverse as maleo fowl, anoa, and macaques; the macaques, for example, may comprise the densest population in southeast Asia. But perhaps most intriguing are their observations of the behaviour of tarsier *(Tarsius spectrum),* a species which has previously been known only by incidental observations.

Over 100 encounters have been made of these nocturnal primates, using a headlamp. The tarsiers apparently live in small territorial family groups based on a monogamous pairbond (as in gibbons). Each family has its own sleeping site which it typically uses every day. Families split up at night to forage, though mates keep in contact and come together briefly at approximately hourly intervals. The tarsiers have at least 15 different calls, the most elaborate of which are the territorial duetting given by families just before retiring in the morning and occasionally in territorial clashes at night. A long wailing call is sometimes given by lone animals. In November – December, most families had an immature animal which typically travelled separately from its parents. A newborn baby was seen in November; The first night the mother did not hunt, only sat huddling the baby and licking it, but after that she resumed normal activity carrying the baby in her mouth. The baby grew very fast and was travelling independently at the age of five weeks.

The tarsier research is being conducted totally at night, after the day's management activities are completed. This project is an outstanding example of carefully-directed research complementing management of a previously poorly-understood tropical rainforest ecosystem.

from **WWF Indonesia Programme Newsletter,** *January 1978*

WILDLIFE VERSUS NOMADIC STOCKS IN SEMI-ARID LANDS

by T. Riney

Nomadism in its pure form is an ecologically acceptable form of land use, capable of continuing for centuries without depleting the basic vegetation resource. However, the increasing sedentarization of nomads and the introduction of more exploitive grazing practices can utlimately convert these marginal lands of low productivity to completely unproductive areas. Since no country can afford to increase its proportion of unproductive land, it is useful to examine the uses and limitations of nomadism and to compare free ranging nomadic pastoralists and their flocks with free ranging populations of wild animals.

The question of the sedentarization of nomads has received much attention over the past two decades and much of the discussion has dealt with a description of various types of nomadic grazing still existing. R.O. Whyte (1966) describes the spectrum of grazing as follows:

"(a) Settled flocks and herds maintained for part or all of the year on artificially fenced pastures, and/or fed with cut green of conserved fodders in yards or stalls.

(b) Grazing flocks and herds maintained on natural or sown pastures on a semi-intensive system, but with a specific unit of land to which they are confined and where they must subsist throughout the year on grazing, supplemented, if necessary by cultivated fodder crops.

(c) Flocks and herds maintained for most or all the year on a system of free-grazing, but following well-defined migratory routes from the communal centre to reliable seasonal pastures elsewhere when grazing at the centre is no longer available.

(d) The truly nomadic flocks and herds which have no fixed centre, but which follow seasonal routes to grazing areas, the annual availability or condition of which is governed by the occurrence of the geographically and seasonally spasmodic and unreliable rainfalls characteristic of regions in which nomadism is the only practicable method of animal husbandry."

This paper compares domestic animals maintained under a nomadic or semi-nomadic form of grazing, (c) and (d), with wild populations of large ungulates, particularly in terms of the effect of these animals on the marginal environments. In doing so it would be useful to first review briefly the ecological background to nomadism. Most of the references to nomadism in the paper are to the drier parts of Africa with which the author is most familiar.

The ecological sense of nomadism

The ecological background for nomadism in arid lands is the seasonal change in vegetation which in turn depends on the scarce and extremely variable rainfall.

Nomads make use of many marginal lands which would not normally be used by man. It is easy to see how nomadic traditions could develop and be maintained for hundreds of years. Nomads must have great freedom of movement to be able to survive times of stress in an environment that is essentially marginal and to take advantage of the growing season of vegetation, nomadic stock may be shifted annually hundreds of kilometres.

One aspect of the adaptation of nomads to difficult environments has been the development of specialized techniques for using to their best advantage the widely spaced water-points and existing grasses, shrubs and trees. When the lower leaves of the palatable trees were eaten the herdsmen climbed the trees to cut forage for their stock and the unpalatable trees were used for fuel.

Such practices may be ecologically acceptable if they do not permamently deplete the vegetative resource, which in practical terms means that the successive periods of over-use must be far enough apart to ensure the survival of the vegetation.

Eventually the environment changes and the even stricter limitations of a downgraded environment force the nomads into regions of higher agricultural potential with attendant socio-political overtones.

The importance of maintaining a stable total environment will be appreciated, for reduction or destruction of vegetation in one part of the yearly travels of a nomad can have disastrous consequences on other parts of the range, on the animals and ultimately on the existence of nomadism itself.

If one considers the rainfall gradient from agricultural land through marginal land to desert it is obvious that the greatest erosion potential would normally be in the desert areas with sparse vegetation, strong winds and erratic rainfall. However, at present, because of past over-grazing, the desert has invaded marginal lands, and even within the lower rainfall limits of agricultural land. The present critical areas for accelerated erosion are thus considerably extended. Areas over which nomads exert their greatest destructive influence almost exactly parallels those areas of greatest p. potential for erosion.

Theoretically, the greatest wildlife potential is w the greatest diversity of habitats can be maintained, which means the agricultural and marginal lands. However, it is actually the lands marginal to agriculture which hold the most immediate promise for developing the wildlife resource as a form of land use in its own right, or as an alternative to the present destructive practices of agriculture and pastoralism as now practised on many marginal lands.

It is especially in areas subjected to over-use by agriculture or pastoralism that animal problems become most critical. The problems can be predicted and obviously should be considered in the initial stages of land use planning.

Comparisons between wildlife and nomadism

In considering nomadism and wildlife two approaches have been chosen: comparing the ecological suitability of nomadism with wildlife, and the effect on wildlife of the various stages of environmental degradation induced by nomadic practices. The second approach is considered first for it is against the background of past and present trends that comparisons of ecological suitability become most meaningful.

Pastoralism influences the composition of the animal complex of the climax-biotic community as well as the vegetational. It is on over-grazed and over-burned lands for instance in Africa that irruptive tendencies are in certain areas displayed by doves, quelea finch, guinea fowl, springbok, impala, wilde-

Guinea fowl (Photo Harrison)

beest, buffalo, elephant and several other species.

This generalization is important to the discussion: the existence, growth and utilization of the various species of wildlife depend on the existence and maintenance of appropriate habitat. Major changes in habitat thus produce major changes in populations of animals. Since, in most African steppe and savanna pastoral lands major changes have been taking place since the turn of the century (and in many areas for much longer periods), it is useful to review these changes generally as they are important to wildlife populations.

It will be clear from the foregoing that any discussion of the suitability of wildlife as a form of land use in areas now used by nomads must be viewed in terms of the extent of departure of the present habitat from a climax type of vegetation. The greater and more sudden the habitat change the stronger the depressing or stimulating effects on wildlife.

This is the ecological background necessary to an understanding of potential wildlife production in a given habitat, or for understanding such animal problems as may now exist or may be building up in the future.

The second aspect of comparing nomadism and wildlife is in terms of the extent to which they may be physiologically and ecologically adapted to environments generally considered marginal to other forms of land use. Although the major obvious difference would seem to be that men have more control of their destiny than wild animal populations, this difference between nomads and wild populations is not as great as one might expect. Once tradition is established in a given generation of nomads it is nearly as binding as the limits of many home ranges of animal species; for example, in many parts of the southern Sahara, nomads exhibit strong territorial behaviour notably in defending their waterholes against use by unwanted groupes.

The water requirements of nomadic stock and wildlife are different. While cattle can endure several days without water, certain species of wildlife, like the addax, can go on for years without a drink, receiving enough water from the vegetation and being physiologically adapted to conserve water. As the food passes through the large intestine most of the water is reabsorbed and the residue appears as small dry pellets.

Hopcraft (1970) observed that, in the heat of the day, cattle lose moisture by excessive respiration. He writes, "With the wild animals, the respiration rate was considerably lower than that of the cattle at the same period of the day, demonstrating a further means of moisture conservation".

"Here then, are the reasons why wild animals do not have to walk back and forth to water as to cattle, and why more energy from the grass-land therefore goes into meat production."

Recent observations on the temperature changes of domestic versus wild ungulates during a day throw still another interesting light on the question of physiological adaptation. It was found that the daily fluctuations in body temperature were considerably greater in wildlife in semi-arid regions than in domestic animals in the same weather conditions. In one study, the temperature of game animals varied ten degrees (F) daily, while under the same conditions cattle temperatures fluctuated only three degrees. "As energy is required to maintain constant body temperature, here is another means of energy conservation in game animals. Furthermore, because eland and kongoni allow their temperatures to rise during the hot day, there is not the same need for the cooling of the body; since the majority of such cooling takes place by sweating and evaporation, far less moisture loss occurs with these animals than with cattle". (Hopcraft, 1969).

These physiological characteristics obviously give wild ungulates considerable advantage over domestic stock in dry areas where food is scarce and surface water is often lacking entirely.

Genetics also play an important role. Different species exhibit considerable differences in the rate

Addax (Photo Oryx)

Eland (Photo Lindblad)

at which they cross the ground while feeding, and in the degree of intolerance shown within and between species. While most of these factors can also be important for domestic stock, daily movements are largely directed by man and any change in the attitude of the nomadic herdsman toward his way of life, will inevitably be reflected in his specific daily grazing programme and thus, ultimately, on the vegetation on which his stock depends.

The intensity of land use by wildlife, for several of the above reasons, is normally light while nomadic stock, particularly in recent years, can heavily exceed the capacity of the land to support them on a permanent basis.

The basic factor affecting wildlife numbers is the available habitat, although from year to year the numbers can be modified downward by hunting or upward by the application of various management techniques. Livestock numbers are principally governed by the attitudes and practices of the nomads, ultimately within the limitations of their habitat, but much effort is made to maintain maximum numbers. This difference between optimum numbers, as dictated by the various factors of the habitat, and maximum numbers, as dictated by the attitudes of man is one of the major basic differences accounting for the more severe effect of nomadic stock on dry environments in comparison with wildlife.

When wildlife alone exists in marginal or desert areas without nomadic grazing the populations fluctuate seasonally and yearly depending on the breeding season and the quality of the environment. Under pure nomadic grazing there is little difference between the wild populations and the nomadic stocks in their effect on the land, for under this system of grazing nomadism closely duplicates the patterns of use of wildlife.

With over-grazing, however, the suitability of the cattle habitat gradually decreases until, ultimately, land is abandoned. At the same time, as has been noted, because of the great range in the spectrum of habitat requirements of the different forms of wildlife, some of the wild species decrease while other increase.

In addition to the physiological aspects mentioned above, the strong point in favour of a potentially greater productivity of wildlife lies in the combination of different species, each utilizing a somewhat different part of the habitat and thus producing more in combination than if only a single species of wild animal were involved, or if one or two species of domestic animals were involved. There are good examples which demonstrate that this productivity can be achieved without destroying the ecological base supporting the production. Wildlife management, therefore, is certainly worth considering as a form of land use in its own right (Riney, 1964, 1967).

Discussion

The thesis of the present discussion is that, when considering nomadic grazing one should first ask if it can continue indefinitely in the manner of

the past few decades. If not, then a change in grazing management may bring about improvement in the form of stability and perhaps a gradual increase in productivity. If marginal lands continue to downgrade, or if environments have been so downgraded that reduced numbers of livestock would be unprofitable and unacceptable to the nomads for economic and social reasons, then it seems appropriate to suggest the use of wildlife either as an accessory form of land use or in a much more appropriate form on a permanent basis.

One common suggestion for dealing with nomadic grazing problems is to make water available for stock in areas where it has been very scarce or non-existent. This over-simplified solution makes sense to manufacturers of pumping equipment and to politicians interested in a quick demonstration of action directed at an important problem. However, viewed ecologically, the idea of solving the nomad question by sinking boreholes would be too frivolous to require a serious answer were it not for the fact that the borehole sinking syndrome is presently a major factor in creating the further loss of marginal semi-arid lands and the spread of deserts.

It is true that by putting down boreholes or making temporary dams or otherwise conserving water it is possible to make water available to stock which could doubtless survive for a time if water for animals were, in fact, the sole factor limiting the existence of these animals. However, as several African countries bordering the Sahara are becoming aware, making water available may permit animals to exist and destroy the remaining vegetation which depends on a small and erratic rainfall. Such artificially induced over-stocking cannot last forever and the animals drop off in condition and eventually have to be removed from these artificially induced drought areas.

If the same new source of water could be made available to both the plants on which the animals depend and to the animals themselves then one could visualize a long term type of land use development based on domestic animals of various types. Failing this, it may be useful to consider the value of searching for alternative types of management or of land use.

It has been suggested by Whyte (1966) that to improve the habitat of the desert, its climate, vegetation and soil, and the place of man and his domestic livestock in this environment, we can progress in two directions. The first is to introduce measures of improved management which will make it possible to utilize the basic vegetation resource on the basis of conservation... "and to produce livestock products characteristic of that environment". The second is to start actions which will make it possible or essential for the free-range graziers and their livestock to gradually rely less on the arid and semi-arid grazing resource and become more sedentary. He further suggests that the latter improvement may be achieved in combination with continuing use of the arid and semi-arid grazing ranges by flocks and herds which move under the control of professional shepherds.

Whatever the form of land use, one must recognize conservation as an integral part of management for even the wild and marginal lands of the world are limited. We cannot afford to continue to develop and permit forms of land use which are destroying the basic resource on which the use forms depend.

Expanding or concentrating nomadic populations have no acceptable concentrating devices. More space is required per cattle unit than in any other form of pastoral use. While nomadism in its purest form is still ecologically acceptable, it is the change away from the originally ecologically acceptable forms of nomadism that has created difficulties.

Whyte's emphasis on the need for gradual change raises an even more important issue. To be effective the solutions must be socially and economically acceptable as well as meeting ecological requirements. Nomads and their stock exist together as a socio-biological unit. In some regions this involves individual families while in others the families form loosely united clans. Any proposed solutions of the nomad problems must make sense to the heads of individual nomadic families or they will not be adopted.

In the case of nomads it may well be that the social parameters are so inflexible that we should be seeking several more ecologically acceptable alternatives for use and management. Whyte suggests the production of "characteristic" livestock products from the environment but on this basis wildlife is even more traditional than the comparatively recently introduced livestock and, in one form or another, must be considered as an ecologically acceptable form of land use.

It should also be clear that it is impossible to consider nomadism as a subject distinct from other aspects of national development. The increasing trends toward urbanization and more intensive agricultural use have had the inevitable effect of reducing the areas which were formerly in unrestricted use by nomads. Thus the requirements of meeting social, economic and ecological limitations apply not only to getting a programme of change accepted by family units, but to national governments and regions as well. The nomad problems thus become ever more complicated as perspectives and objectives enlarge. Under modern circumstances nomadism is like a disease on the land. Already enough is known of the impact of nomads accelerating saharanization to predict that, under present forms of semi-nomadism, the desert will keep spreading; more and more land will cease to be productive and eventually the nomads will be forced to turn to other forms of land use. Fortunately there are some recent trends that give hope.

In the past several decades trends have started which force one to re-examine the use of wildlife

not only as a source of protein but as a potentially more important form of land use. The trend is growing towards the application of more sophisticated types of wildlife management in order to achieve maximum production of protein and other animal products using a variety of wild species.

Another significant trend, growing amongst land use planners in arid regions, is the use of ecological criteria to assess the extent to which present forms of pastoralism are maintaining an environment that may sustain this use on a permanent basis. As more examples of mis-use come to light greater pressures may be expected from various sources to give priority to the stabilization of the environment, and to the development of appropriate forms of land use within these difficult environments. Inevitably, wildlife will eventually become more important in these areas. In areas where it has virtually disappeared wildlife can be re-introduced. In areas which would be suitable for cattle under proper management but which are now depleted, wildlife may be a temporary form of use, the species being carefully selected so that the plants especially favoured by cattle will be allowed to recover. In still other areas several species of wildlife may become a principal form of land use by virtue of their greater potential productivity, superior adaptation to the desert environment and beneficial effects on the health of the dry lands.

It seems important particularly in developing countries to recognize the management and utilization of the wildlife resource as another aspect of management. It can contribute to the recovery, or to the development and maintenance of pastoral lands in wood-land savanna and steppe regions; it can add extra value to some forested areas and be an important source of protein.

For almost all types of land use in marginal semi-arid areas, wildlife can be considered as part of a multiple use programme or as a potential form of use in its own right.

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THAI FORESTRY PLAN

The final result of the voluntary tree planting programme during the rainy season (June-September 1977) is 45,749 ha or about 14.31 percent of the target. The total number of trees planted is 9.9 million trees or about 216 trees per hectare.

from **FOREST NEWS** *Vol 1(2)*

(The actual goal of the Royal Forestry Department was 320,000 ha per year. It is, therefore, very unfortunate that less than 46,000 ha was planted. See also the article by Boonsong Lekagul and Jeffrey A. McNeely on the Thai Forests in TIGERPAPER Vol V no. 1. Ed.)

HOPE FOR RARE INDONESIAN DEER

The rare Bawean deer *(Axis kuhli),* which was being driven rapidly to extinction, may now be recovering as a result of enforcement of a ban on hunting in its sole habitat on Bawean island in the Java Sea.

In a report to the World Wildlife Fund, Mr. Raleigh Blouch of the University of Washington said that he thought between 200 and 400 of these small brown deer survived.

Bawean Island, 150 kilometres north of Java, has an area of only 200 square kilometres and a human population of 70,000. Less than a quarter of the island has forest cover, and of this 60 per cent has been turned into teak plantations in the last 35 years. Since the deer like dense, bushy vegetation the plantations are not much used.

The deer are extremely shy, probably as a result of hunting, and will abandon any areas where wood is being cut.

Mr. Blouch and Mr. Sumaryoto Atmosoedirdjo of the Indonesian Nature Conservation Department (PPA) are building up data on the deer's life and habits so that reserve areas can be established.

The decline in the population began during the second world war when local people were confined to the island and hunted the deer for meat. In addition agriculture has been taking over more and more of the deer habitat, and forests are cut for wood.

from **WORLD WILDLIFE FUND-PRESS RELEASE** *No 1/1978*

MARINE CONSERVATION IN TONGA

by W.A. Wilkinson

Fostering the concept of Marine Conservation in a subsistence society is not an easy task. South Pacific Islanders have traditionally believed that the reefs and lagoons always would continue to provide their annual bounty. Although this assumption has served islanders well for centuries, unfortunately the modern need to support increasing populations, coupled with changed fishing methods, has placed excessive pressures on these resources. In some areas destruction of reef habitats and over-exploitation of fish stocks has resulted. In recent years, the Kingdom of Tonga has had the foresight to see the dangers, and has taken remedial steps in time.

Perhaps the most significant of the Kingdom's efforts has been the establishment of a large marine reserve in the lagoon called Fanga'uta, situated in the centre of the main island of Tongatapu, as a fully protected area. This lagoon, an inland water area of some 2830 ha, is very shallow with deeper channels running through it from seaward. Actually an estuarine area, the lagoon serves as a vital nursery ground for many reef and other food fishes which are the main-stay of the local subsistence fishery.

The Lagoon also supports juvenile populations of grey mullet *(Mugil cephalus)* and several species of penaed prawns, the most important commercially being *Penaeus semisulcatus* and *Metapenaeus ensis*. However, within the lagoon there is no commercial exploitation of these prawns, as bottom trawling has been found to be unselective and destructive, killing large quantities of juvenile food fishes, mainly in the snapper family *(Lethrinus* and *Lutjanus* sp.*)*. The lagoon area is also an important breeding and nursery ground for these species. Actually, all commercial fishing in this area has been stopped, and effective legislation has now been promulgated giving legal powers to the Government's Fisheries Division to control the methods of fishing in this area; to protect the mangrove periphery; to ensure maintenance of habitats for valuable food fishes; to ensure control of the influx of noxious effluents harmful to fish stocks; and to control human developments along the lagoon periphery which might affect the ecosystem. The legislation has now been in effect for over 18 months and already local fishermen appear to have fully accepted the situation. Conditions in the lagoon have improved; for example there has been a marked improvement in the beds of the mussel *Modiolus agripeta* which has, in recent years, been over-exploited to near extermination of the population. Other species of shellfish, such as the clam *Codakia* sp., are also important features of the lagoon. Three species of the edible alga *Caulerpa* are also found in the lagoon, principally in very shallow areas. These have been used extensively by the local Tongans, and are a rich nutrient additive to their traditionally high carbohydrate diet of root crops. This resource has also suffered from excessive harvesting in the past.

The establishment of the Fanga'uta protected area is quite a significant accomplishment in the Tonga region, and already benefits to the ecosystem are noticeable. This will make the task of establishing similar protected areas elsewhere in the Kingdom an easier one. Legislation to establish Marine National Parks and Reserves in Tonga is already in existence, and several well-defined areas have already been set aside for this purpose. One such area includes recreational beaches, on the mainland of Tongatapu, which are favored areas for visiting tourists. The visitors will not be precluded from these areas but they will be required to observe basic rules of conservation. For example, shells and live corals will be protected and tourists are encouraged to observe the exotic reef fishes and coral formations in their natural habitats. Parks such as

these should be an attraction to tourists, a fact which has been proven elsewhere in the world.

Two outlying islands also have been declared as Marine Reserves. The island of Malinoa, approximately nine miles north of Nuku'alofa, has historical as well as natural interest. There, in earlier times, would-be assassins of the then Prime Minister Rev. Shirley Baker were summarily shot beside their own graves. The graves are clearly marked and well tended to this day—perhaps an indication of some sympathy for the deceased. Nearer the capitol of Nuku'alofa the typical atoll called Monuafe has also been declared a Reserve. This is considered one of the best shelling atolls with a fringing reef of Stag's head coral. *(Acropora* sp.*)*. This area has suffered recently from a local method of fishing—called "Tu'afeo" in Tongan—which is particularly destructive to habitat and fauna. The method is simplicity itself: a large coral head is encircled by a small mesh net, and then the coral head is systematically broken up and the small escaping reef fishes captured in the encircling net. All fish—unfortunately mostly very small specimens—are taken in this way, and the habitat itself is irretrievably destroyed. Creation of Marine Parks can effectively control this destructive method of fishing, which has devastating effects on the long-term productivity of the reef.

In Tonga, we are pleased to note that the South Pacific Commission has recently appointed an Environmental Officer to its staff. He will be involved in the coordination of conservation efforts throughout the region, as well as advising on environmental policies, both terrestrial and marine. Hopefully, educational systems in the region will play their part in ensuring that environmental studies—even in the simplest terms—are included in the curriculums of both primary and secondary schools. Only by inculcating essential environmental concepts in the young people of the islands will we ensure the future preservation and wise use of island marine ecosystems, which is so essential for future food requirements, as well as the attractiveness of the islands to visitors. Though much remains to be done, the Kingdom of Tonga has made an encouraging beginning. We hope other Pacific Island areas will follow.

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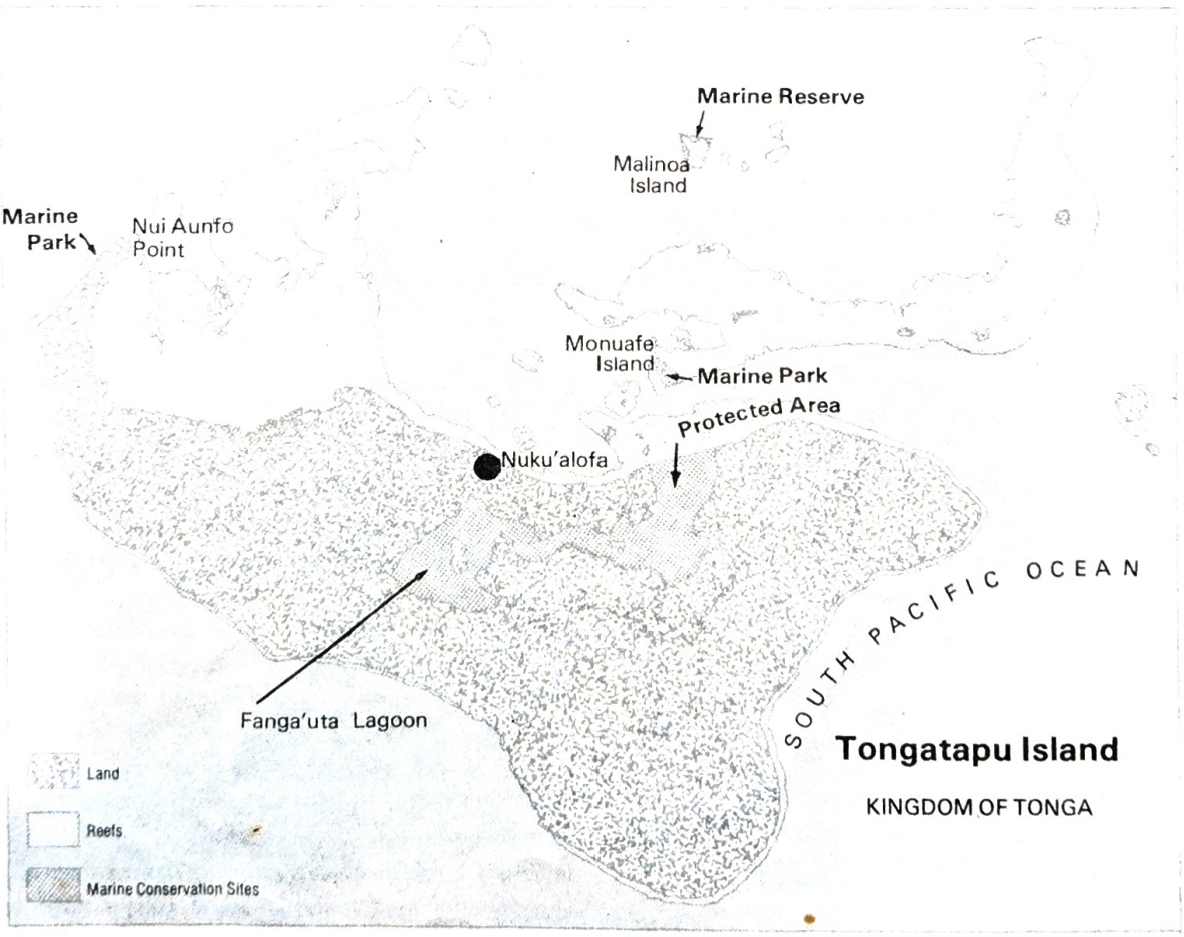
from PARKS *Vol 2 no.2 September 1977*



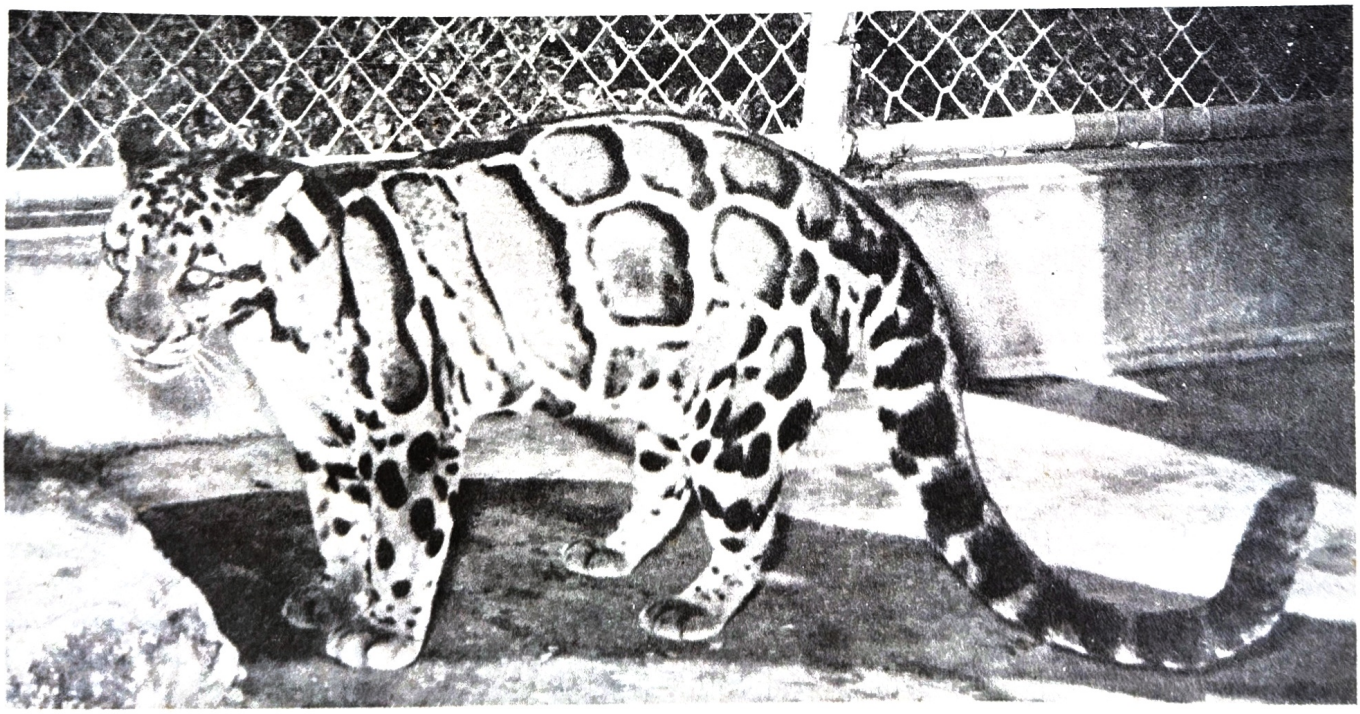
THE GUNONG MULU SURVEY

The Gunong Mulu Survey Expedition which commenced work in Sarawak in July and will continue until September 1978 is making good progress. Sponsored by the Royal Geographical Society of London and led by Mr Robin Hanbury-Tenison, an experienced expedition leader, Base Camp in the local style of a Longhouse was completed in July to provide accommodation for the British and Malaysian scientists and other personnel who are surveying the Park on behalf of the Sarawak Government. The purpose of the expedition is to study all aspects of the recently created Park which is described as the 'richest, most extraordinary and beautiful tropical rain forest in the world'. From the extensive studies to be undertaken, a Management Plan for this Park will be prepared. Since this is the first time that such a detailed study of a rain forest national park has been carried out, it is confidently expected that the Gunong Mulu National Park may well become the foremost National Park in South East Asia.

Base Camp has been established 90 miles up river from the town of Marudi deep in the hinterland of Sarawak. Whilst the jouney from Marudi takes 12 hours by long boats, the expedition has a Hamilton Jet Boat that can undertake the hazardous journey through the rapids in 3½ hours. Supplies for the 40 or so expedition personnel has proved one of the most difficult and expensive problems.

Four sub-camps, three of which reach towards the summit of Gunong Mulu at 2,376 metres have been established and are in use. These camps were established with the assistance of helicopters from the Royal Malaysian Air Force who in the words of Mr Hanbury-Tenison 'did an excellent job and were a major contribution to getting work commenced so quickly'.

During the 15-month period of the survey, some 40 Malaysian and British scientists with support



Clouded Leopard

personnel will be in the Park for varying periods of time. Scientific results should be of great value both in increasing understanding of rain forest management and in developing methods for the wise use of natural forested areas for environmental conservation. The Management Plan, is addition to providing the scientific data for the sound development of the Park, will provide guidelines for the development of tourist amenities to enable people to enjoy the scenic beauty and grandeur of a tropical rain forest park. Numerous limestone caves, the climb to the summit of Gunong Mulu or to the unique limestone pinnacles of nearby Gunong Api should provide Sarawak with a tourist attraction of the highest order. It is too early as yet to foresee what treasures the Gunong Mulu forests may yet reveal though already a new species of bat not previously recorded from Sarawak has been discovered.

Already some 30 scientists have begun work on the inventory of the flora and fauna and into various other aspects of the complex forest ecosystem. Botanical parties comprising scientists plus personnel from the Forest Department Sarawak have made collections of interesting plants and an ecological study in the different types of forest present has commenced. Other scientists have been working on the animals, birds, butterflies, reptiles and amphibians, and two scientists from the British Museum are studying certain groups of insects. The presence of several types of monkeys, Gibbons, Barking and Sambhur Deer and the rare Clouded Leopard have already been confirmed. Several limestone caves have been partially explored and one known as the Deer Cave, so called because it is regularly visited by both Barking and Sambhur Deer, is likely to prove extremely interesting and of great tourist value.

The cost of the 15-month long expedition which is likely to exceed MS 200,000 is being met by funds raised by the Royal Geographical Society and the World Wildlife Fund from sources in Europe and Malaysia. Many British firms with interests in the Far East and some local companies in Sarawak have contributed to the expedition though more funds are urgently required if the survey is to be completed as planned. Mr. Ken Scriven, Executive Director of the World Wildlife Fund Malaysia visited the expedition last week and presented a cheque for MS 5,000 to Mr Hanbury-Tenison representing donations received from donors in Sarawak. WWF Malaysia whose contributions go towards the cost of Malaysian participants, is seeking a further MS 20,000 to meet its commitment and it is hoped that all Malaysians with an interest in the preservation of such a unique area as the Gunong Mulu National Park will respond generously.

All donations to WWF are tax deductible in Malaysia.

From **World Wildlife Fund Malaysia** *Press Release 11/7*

Sambar Deer

SURVEY OF CHILKA LAKE

The University Grants Commission, New Delhi, has sanctioned a major research project entitled "Zoological survey and hydro-biological studies of the lake water and polluted water of Chilka Lake, Orissa, India", to be conducted by Dr. M.V. Subba Rao, Post Graduate Department of Utkal University, Bhubaneswar, India, and two research scholars.

Chilka, the largest brackish water lagoon of India, is situated on the east coast of the sub-continent between latitudes 19° 28' and 19° 54'N and longitudes 85° 6' and 85° 35'E, and is connected with the Bay of Bengal.

Covering an area of 906 sq. km., the pear-shaped lake expands to 1165 sq.km. during the rainy season. A 35 km. long channel called the "outer channel" connects it with the sea, while it receives fresh water from the river Mahanadi.

Dr. Rao is very much interested to exchange research reprints on Herpetology and Limnology His address is: P.G. Department of Zoology
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ECOLOGICAL GUIDELINES FOR DEVELOPMENT IN TROPICAL RAIN FORESTS PART II

by Duncan Poore

This is the conclusion of the two - part series of excerpts from Duncan Poore's "Ecological Guidelines For Development In Tropical Rain Forests". Part 1 was published in **Tigerpaper** *V: 2.*

Allocation, conflicts and multiple use

Society has a number of possible uses for areas covered with tropical forest, and the allocation of forest areas to such uses is of the highest importance if they are to be used wisely. It may be decided to keep the forest as it is because of its intrinsic values, to manage it as a source of raw material or to remove the forest and use the soil for other purposes.

The following sections deal with areas which have been allocated for protection or for management as a source of raw material.

Apart from their importance as a significant part of the world's reserve of forested land, areas of tropical forest are valuable:

a) as sources of forest products, both plant and animal—timber, fruit, latex, drugs, bamboo, rattan, honey, fish, animal skins, etc.;

b) because the forest acts as a guardian of soil fertility, prevents erosion, regulates the runoff of water and possibly has a moderating influence on climate (protection forest);

c) as samples of forest ecosystems containing the genetic resources of the plant and animal species (and the varieties of these)—many of which are likely to have economic potential—in the region; or as examples of untouched natural landscapes (national parks and nature reserves), retained for cultural, scientific, educational and recreational values and as controls against which the effects of changes to similar areas can be assessed.

Forest will normally, therefore, be allocated:

a) for the preservation of species, ecosystems of landscape;

b) for protection of soils and water catchments; and

c) for yielding forest produce.

These uses may be complementary to one another but they also often compete. For example, it is usually possible to allow areas in protection forests to be used for scientific research, education and recreational tourism provided that part remains regulated so that it is consistent with the primary aim of protection. Indeed as well as being a reserve of genetic material, these areas must serve the interests of science, education and recreation. But these interests will suffer if the protective function is neglected.

In addition to allocation, therefore, it is crucial to be clear and explicit about objectives of management.

Guidelines

Where it has been decided that an area should be allocated for a protective use, this should in all cases take priority over other uses.

Other uses—for example extraction of timber or use by the public—can easily damage irreversibly the protective value of the forest.

14. For each area a primary objective of management should be stated and any other uses which are

inconsistent with the primary use should not be allowed.

15. Within the constraints set above, the use of areas in the fullest interest of the community should be encouraged and imaginative ways of "multiple use" should be devised.

Preservation of natural ecosystems and genetic resources

Within the tropical forest regions there are a great number of forest types, and other natural ecosystems, each containing its own combination of species according to local differences of climate, soil, altitude and geological history. It is highly important to conserve samples of each of these, sufficiently large to be self-perpetuating and to encompass the range of the larger mammals and migratory species. Particularly important is the conservation of samples of lowland rain forest on fertile soil, for these contain ecosystems of the greatest richness and luxuriance.

If samples of the various types of forest are chosen well and chosen early (which implies a survey of the resource), the percentage of the total land area devoted to them need not compete unduly with other forms of land use; and, by careful planning and management, it may be possible to combine their protection with other socially and economically valuable uses (e.g. recreation, education and tourism).

The conservation of natural ecosystems will provide a reservoir of populations of wild plants and animals and of the variation within them under conditions which will enable evolution to continue under substantially natural conditions. But, in addition to these protected areas, there is great scope for managing other land in such a way that it contains an abundance of wildlife, and, wherever possible, this should be made a supplementary objective of management. With the careful application of ecological knowledge it is frequently possible, for example, to maintain substantial populations of wild plants and animals in areas of forest that are being managed for an economic crop—indeed these wild plants and animals may themselves be part of the crop. Where the land has been transformed for intensive agriculture, the maintenance of wild populations is sometimes more difficult. But the more ecological knowledge can be applied to maintaining a number of species in such areas, the less the risk of epidemic outbreaks of pests.

Guidelines

As an integral part of planning, suitably large examples of natural ecosystems and of populations of plant and animal species should be protected.

These represent an important resource and should be maintained as a reservoir of continually evolving genetic material, for their cultural, scientific and educational value, as samples of outstanding or typical natural landscapes, as a reservoir of wild animals and plants which may enable them to be cropped in surrounding areas and as samples of unchanged communities to provide controls against which the changes brought about by other forms of land use may be measured and assessed. It is important to maintain samples for these purposes even on potentially rich agricultural soils.

16. An assessment should be made of the intrinsic

Settlement in rainforest (Whitaker)

value of land in relation to the conservation of flora, fauna and natural ecosystems.

17. In specific situations, where there are areas of outstanding and possibly of unique value, high priority should be given to their protection and this should be given preference over other forms of land use. This is particularly urgent in lowland forest.

18. The size and characteristics of the areas protected should be related to needs of the plant and animal communities that they are intended to protect. Wherever possible large areas should be chosen to include examples of different ecosystems, representing, for example, different altitudinal zones on a mountain or gradations of climate.

19. Wherever possible areas set aside to safeguard samples of natural ecosystems should be surrounded by buffer zones taking advantage of physiographic and other natural protective features. These should be maintained under natural vegetation but can be used for any form of economic land use which does not interfere with the integrity of the protected area.

20. The objectives of management for such protected areas should be carefully defined and adhered to. They should include maintaining part of the area completely undisturbed as a standard for comparison; but in the remainder, use for scientific study, for education and for recreation should be encouraged, provided that these uses do not conflict with the primary purpose of protection.

21. There should be a management plan for each protected area, and the course of management should be monitored to assess whether the original objectives were reasonable and the management has been successful.

In planning the overall development of any area, provision should be made for the migration of animals and dispersal of plants between protected areas.

When the land surrounding protected areas becomes intensively used, these are left as "islands" and are very vulnerable to such external changes as fluctuations in climate. The danger of losing species can be lessened by making reserves larger and more varied, or by regulating land use in the areas between them so that migration is possible.

Management of land outside protected areas should be carried out in such a way that reasonable populations of wild plants and animals can survive in them.

This, by maintaining variety, may often prevent any of these species from becoming pests. It also serves to keep up populations of the species themselves.

The protection of plant genetic resources in natural protected areas should be supplemented by documented collections in botanic gardens, arboreta and seed banks.

This will provide an additional insurance against extinction in the wild but is no substitute for conservation in protected areas. It is impracticable to provide for all species, and natural evolution cannot continue under these conditions.

Protection forests

There are certain areas where the forest acts as a guardian of soil fertility, prevents erosion, regulates the run-off of water and possibly has a moderating influence on climate. It is very important to maintain these characteristics.

Guideline

Where slopes are so steep or unstable that disturbance of them would lead to soil erosion and accelerated run-off of water, the protection of these must be the primary aim of management.

The purpose of this is to maintain the quality of the soil in the catchment and to regulate the quantity of the water delivered from it, by preventing erosion, siltation and excessive fluctuations in water flow.

22. Areas must be designated whose primary function shall be catchment protection. Such areas may be used for a harvest of forest produce or other use provided this does not interfere with their primary function of protection.

Modification of natural forest for timber production

Timber and other wood products for domestic use and for export come from three main sources: from managed indigenous forests; man-made plantations; and during the conversion of natural forests to other land uses.

The rate of timber extraction in tropical forest areas has grown very rapidly in the last decade. Indeed it is likely that the present situation of surplus will move to one of scarcity; and that supply from primary forest will have to be replaced by that from secondary forest or plantations, both producing wood of a different quality from that being harvested now.

The crop that is produced by manipulation of the natural forest may be economically more valuable than the original forest, having fewer species of a higher growth rate and more uniform wood, often of lower density.

As a result of land pressures, many lowland forest areas are being transformed into agricultural lands, and forestry production is being pushed onto poorer soils or hilly areas where many of the silvicul-

Development or Destruction (Rijksen)

tural problems of forestry have not yet been resolved.

Until the necessary knowledge is available it would be well to exercise caution in management, and research should be speeded up to provide the necessary information for sound management.

Where the primary objective of management of production forest is timber, combined with that of minor forest produce and wildlife, the objectives are usually met most satisfactorily in a forest having a structure and composition near to that of the natural forest, as this tends to be more stable under local conditions and to provide best security against epidemics, etc. Therefore it is advisable to go no further than is necessary in changing species and structure.

Guidelines

When an area is to be managed for the production of timber or other forest produce, including wildlife, this should be done in such a way that the potential for maximum sustained yield is maintained and the resource capital is not depleted.

The relative values of the various products may change from time to time and new uses may be discovered. Some areas of managed forest, for example, have an important supplementary value as a habitat for wildlife, which may provide a significant source of food, of revenue from exploitation and of reserve stocks of the species concerned. A forest which still retains its varied potential can best respond to changes in demand.

23. Such forest should be managed according to the best principles of silviculture and in such a way that the natural composition and structure are altered no further than is necessary.

24. Management should be directed at getting the best total return from all forest products consistent with maintaining the potential.

The production of timber and other forest produce should be planned to meet predicted demands, including those for fuelwood and other local uses.

The forest is abused when demand exceeds supply. The need for fuelwood, for example, can under certain circumstances make very large inroads. The development of plantations can help to reduce pressure on those areas of forest which should be protected, and may also enable areas of forest to be kept in reserve for future allocation. The provision of adequate local fuel will reduce dependence on imported sources of energy.

25. Predicted timber requirements should take account of local needs for fuelwood. When the viability of the forest is threatened by fuelwood collection, special plantations should be established near the site of demand but outside the forest, and alternative sources of fuel should be developed, (e.g. bio-gas).

26. In order to help meet predicted demands for timber and wood, trees should be planted in non – forested areas wherever there are suitable sites. These need not be confined to blocks of plantation.

27. Where agricultural land has been abandoned such land should be used for plantation forestry rather than clearing native forest for plantations.

Transformation of natural forest into field and plantation crops

Although highly successful systems of agriculture both for food and cash crops have been developed –for example, in parts of South East Asia–the humid tropics are not an easy area in which to conduct stable and profitable agriculture. Large areas of scrub and secondary grassland bear witness to efforts that have

been less successful. Soils are often infertile and have a poor structure; they are readily damaged by exposure to insolation and the impact of rain drops; many areas with high rainfall suffer from periods of intense drought; and conditions favour the rapid growth of weeds and serious infestation by pests.

Most of these difficulties can be overcome, on fertile soils, by careful choice of site and crops, and suitable techniques for clearing the land and subsequent management. It should be recognized, however, that the greater the specialization or tendency towards monoculture, the more likely the dependence on imported energy and fertilizer. Where systems of productive agriculture exist which do not depend on great imports of energy and fertilizers these will have the advantage of stability in a world in which energy is likely to become scarce and more expensive.

In general every effort should be made to intensify production on fertile soils or to raise the status of areas which have already been cleared, before deciding to open up new areas of forest to agriculture.

Guidelines

When, after careful assessment, it has been decided that forest should be transformed for some other use, all possible ecological knowledge should be brought to bear on (i) the choice of that future use; (ii) the methods used to carry out the change and; (iii) possible incidental effects.

It is easy to permanently reduce the potential of a site or cause serious incidental damage elsewhere by neglecting such precautions.

34. Land should only be used for cultivation or plantation crops when sufficient survey of the ecological conditions has shown that the area is suitable for such crops if appropriate methods of cultivation are used; and field trials or observations have confirmed this assessment.

35. Any modification or transformation of the existing vegetation must be carried out in such a way that the least possible harm is done to the soil by radiation and rainfall, in order to retain organic matter, fertility, and adequate soil structure.

36. Careful studies should be made of traditional and indigenous systems of agriculture which have produced a sustained yield under these conditions. Every attempt should be made to extend such stable and productive indigenous systems, or suitable elements of them.

37. Particular attention should be paid to the public health problems arising from forest clearance.

38. Special attention is drawn to the danger of introducing species of animals for domestic purposes under range conditions where there is any opportunity for escaping into the wild. (Animals such as buffalo and goat have caused considerable ecological and economic damage in many situations after escape from domestic control.)

39. Careful studies should be made before the transformation of mangrove and swamp forests to agriculture or fisheries so as to avoid long-term and irreversible effects to these ecosystems.

As far as possible systems of agriculture should be favoured that do not rely heavily on the import of energy and fertilizer.

Mechanization and the use of fertilizers should of course be favoured where appropriate, but the increased vulnerability of an agriculture which becomes dependent on them should be recognized. It is possible to intensify agriculture without either of them.

The conversion of humid forests to open grasslands for the grazing of ruminant livestock should be approached with caution.

Such pastures have sometimes proved productive, particularly when they have been developed on fertile soils, but more often they have failed, resulting in degradation of the areas and low productivity of the livestock. Alternatively those practices which have involved integrating livestock and tree production in various ways are promising.

40. Alternative systems are urgently required both to improve animal production and to prevent unnecessary destruction of forest.

41. Improvements in ruminant livestock production can most suitably be obtained by:

a) Development of new and suitable breeds;

b) Increasing the productivity and hence the carrying capacity of existing pastures by the use of multispecies forage and stress on improvements in management;

c) Integration with field and tree crop production; and

d) The utilization of all available by-product feeds.

42. The improvement of nonruminant livestock production can probably best be accomplished by ensuring continuous and economic supply of suitable feeds, which should include as many locally produced by-product feeds as possible. There are also possibilities for integrating pig, chicken and duck production with fish production.

43. Wherever possible, tree crops should be integrated into systems that include the raising of animals and production of food crops.

44. Every effort should be made to improve the productivity of existing savannas by the introduction and testing of new forage species, the solution of the problems of dry season feeding and overall improvements in management.

45. Further efforts should be made to domesticate indigenous animals for sustained production (e.g. deer, banteng, crocodile).

TRENDS IN INTERNATIONAL ENVIRONMENT LAW

by Peter Sand

Environmental problems are not caused by natural or technological factors alone, but may be generated or aggravated by socio-economic factors. A well-known example is land degradation and desertification, where inadequate patterns of land and water management are often closely tied to the underlying legal structure of ownership and rights of use. Overintensive farming, for instance, may partly be a result of excessive fragmentation of holdings, due to existing land tenure and succession laws. Overgrazing may stem from traditional rights of land use insufficiently adapted to changing economic and demographic circumstances. The mutual legal claims of upstream and downstream water users, whether based on contiguity or acquired rights of use, may prevent optimal development of shared water resources. Similarly, the historical legal regime of the oceans raised the danger of overexploitation of common marine resources.

Usable instruments

"Outdated" legal structures may thus act as constraints on the rational management of resources – though not necessarily so: many countries have begun to re-discover the advantages of adapting existing legal instruments to the new requirements of resource conservation and environmental protection; examples are the discharge permits required pursuant to the 1899 U.S. Refuse Act or the remedies for neighbourhood nuisances (troubles de voisinage) available under nineteenth century European civil codes, both of which have been turned into useful instruments of pollution control today.

The very multitude and diversity of laws applicable to natural resources and environmental matters, and the ensuing risk of overlapping or contradictory regulations on competences, have been recognized as a problem in most countries. While the need for coordination and administrative reorganization in this field is urgent, new integrated legislation should not be considered as a panacea. The effectiveness of modern environmental law depends to a large extent on sound "sectoral" legislation and administration for specific resources in such traditional fields as land and water law; forestry, fisheries and wildlife legislation; health and food regulation.

Legislative shortcomings

One of the shortcomings of past legislation for the conservation and protection of natural resources has been its predominantly negative and punitive approach. While legal restrictions are necessary to avoid overexploitation and interference by incompatible activities, legislation should do more than just prohibit pollution, hunting, or timber-felling. The need

to combine sanctions with positive incentives to implement policy objectives, and the need to provide a legal basis for resource planning and management, arise both at the national and the international level. For example, the 200-mile extension of national jurisdiction over living marine resources, which is emerging from the Third U.N. Conference on the Law of the Sea, involves increased management responsibilities for coastal states and creates a need for review and harmonization of legal regimes and institutions.

There is a close interrelation between national and international aspects also as regards the effects of legal rules on international trade. Strict environmental controls unilaterally applied to certain commodities and products in one country may seriously affect imports from other countries. In order to reconcile conflicting national laws and standards in this field, international efforts at harmonization are required, along the lines of the work already undertaken by the Joint FAO/WHO Codex Alimentarius Commission.

As different countries share common problems of resource management and environment protection, they can share the experience acquired in coping with these problems and endeavour to develop mutually acceptable solutions. International exchange of information for this purpose includes legal data exchange. Several U.N. specialized agencies have for many years disseminated information on the current legislation of their Member States in such environment-related fields as health law (WHO *International Digest of Health Legislation*), and renewable natural resources law (FAO *Food and Agricultural Legislation series*). The Principal aim of these information services is to bring innovative recent developments in national legislation to the attention of other interested countries, thereby facilitating also ongoing technical assistance activities. In 1976, FAO and UNEP initiated a joint experimental project for the cataloguing of such environmentally relevant legislative data by computer.

A significant trend in both national and international law-making in this field has been the broadening scope of legal rules, from a "use-oriented" to a "resource-oriented" perspective. Some countries have attempted comprehensive codification of all rules relating to renewable natural resources and environment protection, in a single "environment code". Others, while retaining separate legal instruments for different categories of resources, have introduced substantive reforms, with a change in emphasis from the police functions to the management functions of the law and to new incentives for compliance; from classical nature protection to natural resources conservation; from water and air pollution controls to general antipollution acts; from provisions for specific dangerous chemicals such as pesticides to the regulation of all potentially harmful substances; and from laws protecting specific species of animals and plants to trade controls over primary and secondary products derived from them.

At the same time, besides re-allocating administrative competences between existing and new institutions, a growing number of countries have enacted "framework legislation"laying down general policies and procedures for environmental management, including citizen participation in decision-making. The regulatory systems developed for this purpose usually require either special licences, or environmental impact statements, for all activities involving potential environmental risks. At the international level, a combination of legal restrictions with compulsory licensing and joint technical measures has been developed, e.g., for the control of waste dumping in ocean and inland waters. There also is a common tendency to establish – by law, and in some cases by international agreements – functional administrative units for ecological areas which are either particularly suitable for resource management (e.g., self-governing water basin authorities) or are particularly endangered (e.g., nature reserves and parks).

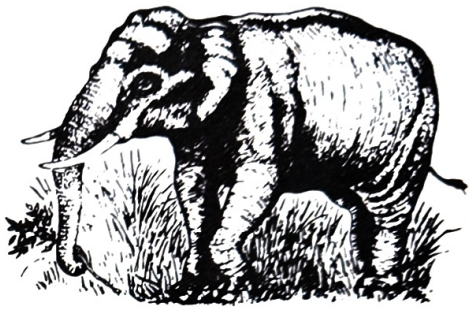
There now are more than 40 multilateral conventions dealing with natural resources management and conservation, especially of the marine environment. While a number of these treaties are global in scope (possibly culminating in a future convention on the law of the sea), the main advances in recent years have been made at the regional level. In particular, a number of new legal instruments were created, and existing agreements revised, for the joint management of inland water resources and ocean fisheries and for environment protection in special marine regions such as the Baltic, the Mediterranean and the Red Sea. Together with bilateral agreements on shared resources and transfrontier pollution, and with related declarations, recommendations and standard-setting activities of several international and regional organizations, these instruments may be considered as part of the growing body of international environmental law. Besides serving as secretariat for several of the institutions concerned, FAO has contributed to the development of new methodological approaches in this field by way of information exchange, legal drafting assistance, and through the organization of expert meetings and intergovernmental conferences.

Peter H. Sand is FAO Legal Officer, Environment Law. This article is based on a survey prepared in connection with the 1977 FAO report on The State Of Food And Agriculture.

from **Unasylva** *Vol 29 No. 116*

IUCN/SSC ASIAN ELEPHANT GROUP

NEWS NO 4



ASIAN ELEPHANT GROUP NEWS – NO. 4

1. GENERAL

1.1. SSC Meeting

Between 5–11 February 1978, there was a meeting of IUCN's Survival Service Commission. The two elephant specialist groups were represented by Dr. Harvey Croze, Co-Chairman of the African Elephant Group. The following are extracts from his report presented at the above meeting.

"As a result of primary analysis of the Survey results and the collation of specific recommendations, it has been possible in the last few months to initiate a world-wide Action plan for the national conservation and management of elephants and their environments. The general form of the plan is modelled on that of the 'Seas Must Live' Campaign, and a first draft was presented to IUCN in September, 1977. (see **Tigerpaper** 5 (1):20–24)

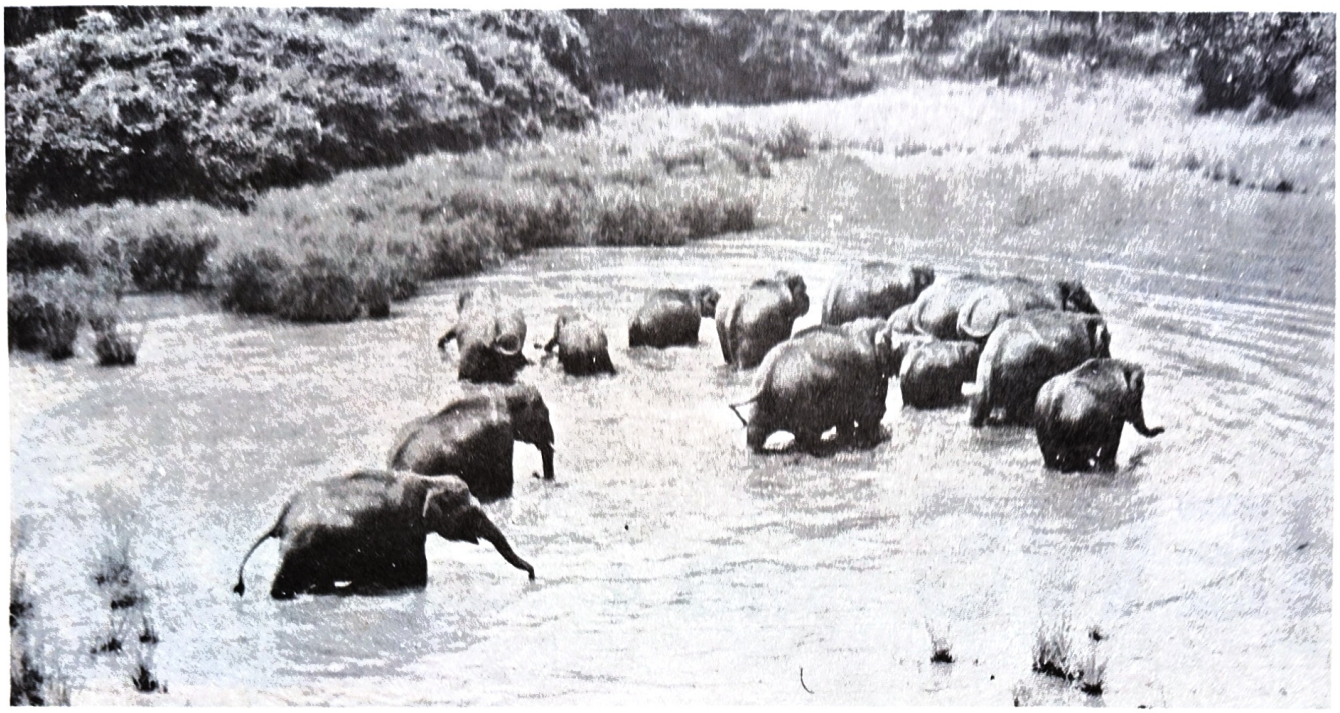
It must be stressed that this is a dynamic *Action* Plan. Even before the ink was dry on the latest draft, we were able to tick off elements of the plan that were being tackled.

The task, you will agree, is enormous: if all the elements of the Action Plan were tackled, it would take many man years and several million dollars. So far, we have funding for only a handful of the Highest Priority needs.

The Elephant Group is confident about its ability to organise the implementation of the Action Plan and oversee the collection of data, but we are becoming a bit worried about the daunting administrative logistics facing us. In a few weeks, when the latest draft of the Action Plan is laid before you, we will say: 'Here it is:– an outline for the future of elephants and a good portion of their habitats. We believe it is essential and we can do it, but we need a bit more administrative support to function efficiently as the full secretariat we have become.' The immediate requirements are a full-time administrator, and continued support for our activities in the form of funds for projects.

A final point, which we would table again for consideration, concerns the next large WWF campaign.

Elephants, like whales, have always intrigued



Two elephant family units drinking together in the Bandipur National Park, Karnataka, India. (Johnsingh)

us. They certainly attract our attention. The current global attention that elephants are receiving—from the U.S. Congress, from the international press, from the world investment markets, and from at least a score of independant conservation groups which have approached us – all goes to suggest that the elephant would be a fitting touch stone for a major WWF/IUCN conservation campaign. The Campaign would address itself not just to elephants, but to their habitats and all the other species, including man, dependent on those ecosystems.

We would like to suggest the following general objectives for an 'Elephants and Ecosystems' appeal...

(a) To identify and highlight the critical problems of slow-growing, long-lived, resource-expensive species who share many terrestrial ecosystems, such as elephants, rhinos, trees and man.

(b) To develop practical strategies for sound resource management of such species and their habitats, and instill a thinking which encourages ecosystem conservation, particularly in countries in which environmental extremes result in recurrent starvation.

(c) To demonstrate the dependance of man on functioning natural ecosystems, by conducting a global survey which identifies all the critical interfaces between man and nature and results in a 'Home Range of Man' map.

(d) To present in an understandable manner, a description of the dynamics of major global ecosystems, coupled with clear descriptions of the limits to which such systems can be exploited.

(e) To increase communication between the policy makers and the people who share ecosystems with animals, to identify the needs of all three groups and to demonstrate and increase the advantages of their interrelationships.

The general message of this campaign would be: 'Conserve the whole, and you conserve the parts: Conserve ecosystems to save species.' The conflict between man and nature used to be simply an interspecific affair. It is fast becoming a worldwide conflict between man and whole ecosystems, of which he used to be a balanced part. The sooner we turn our conservation and public relations attention to whole systems, the more realistic are our chances for the (very near) future to save species such as the elephant.

The elephant, we believe, is an ideal symbol for such a campaign: it is as compelling and threatened as the whale, and, like man, it is designed to survive environmental extremes in a wide range of habitats".

1.2. Asian Elephant Secretariat.

The IUCN/SSC Asian Elephant Secretariat has received an additional grant from WWF under Project 1551, to allow it to continue operation for a second year.

In its Progress and Financial reports for 1977, the first year of operation, the Secretariat reported

significant progress in the following areas:

(i) Co-ordination of activities oriented to the conservation of Asian Elephants.
(ii) Establishment of collections of written and photographic resource materials.
(iii) Production of reports, working papers, and research proposals.
(iv) Education. An audio-visual education programme was produced as described in the last **News.** (see **Tigerpaper** 5(2): 28–33)
(v) Redistribution of resource materials.
(vi) Publications, including the quarterly production of **News** in **Tigerpaper.**
(vii) Lectures, broadcasts, and press releases.

Copies of the Secretariat's 1977 Progress Report may be obtained from IUCN/SSC Asian Elephant Secretariat, Dept. of Applied Biology, University of Cambridge, Pembroke Street, Cambridge CB2 3DX, England.

2. BURMA

According to Burmese newspapers, the Timber Corporation has captured eight elephants, five by its two immobiliser teams and three by the trapping team, up to the end of February 1978. The teams have now exhausted their stock of anaesthetics for the immobiliser darts and need fresh stocks to continue their work to meet a target, apparently of 14 elephants.

The IUCN/SSC Asian Elephant Group has no further details of the Timber Corporation's annual trapping quotas in Burma, and appeals to readers for further information. We may also be able to help the Burmese authorities obtain the drugs they require.

According to a separate report, the Forest Department managed to seize more than 225 pounds of tusks from persons who obtained them illegally from 1975 to 1978. It seems that ivory poaching is still carried on to a greater extent in Burma than any other country in Asia. Figures for seized ivory probably only represent the tip of an iceberg, and despite valiant attempts, the authorities appear to be finding it difficult to wipe out this particular threat to the country's elephants. The last estimate for the population of wild elephants in Burma known to us was 5,000 (U Hla Aung, personal communication, 1977).

3. INDIA.

Status and distribution of elephant populations of Karnataka.

This report by P. Vijayakumaran Nair and Madhav Gadgil of the Centre for Theoretical Studies, Indian Institute of Science, Bangalore, is based on surveys carried out in the State of Karnataka over a period of more than three years from May 1974 to July 1977, with the co-operation of WWF–India and the Karnataka Forest Department.

For descriptive purposes the authors divide the Western Ghats areas of Karnataka, along with the eastward extension of hills across the Mysore plateau, and which together constitute the elephant habitat, into five areas. The number of elephants estimated to survive in each are summarised below.

(a) **North Kanara:** less than 20.
(b) **Crest line of the Western Ghats:** approximately 40.

Ivory poaching still appears to be a significant threat to elephants in some parts of continental South-east Asia. (Photo Boulton)

The Mysore Plateau, incorporating the deciduous forests typical of the adjoining Bandipur and Mudulunai sanctuaries shown here, probably holds the largest elephant population remaining in South India. (Photo Olivier)

(c) **Malnad:** approximately 100.

(d) **Mysore plateau:** at least 1,300. The area comprising of Wynad, Mudumalai, Bandipur, Kabini, Kakanakote, and Nagarhole would appear to be the most important contiguous range for elephant, containing the largest number. This area probably constitutes the best hope for the elephant in South India.

(e) **Kollegal hills:** less than 200.

There therefore appear to be about 2,000 elephants remaining in Karnataka. The authors speculate on their future and offer suggestions as follows:

"Taking all factors into account, the fate of the isolated small herds of North Kanara, Western Ghats and Malnad areas seems sealed. There seems to be little hope of saving them, and they appear destined to be shot one by one and disappear, as many other herds have over the past half century in these areas. There is much more hope of conserving the Mysore plateau population in the Bhadra sanctuary area, in Nagarhole and Bandipur sanctuaries, and possibly those in the Kollegal hills also. Even in these areas the future depends on preventing further shrinkage of habitat and encroachment by cultivation in the heart of elephant forest. Even though everything is done for the maintenance of the integrity of the habitat, a certain amount of crop-raiding will inevitably continue. An effective scheme for granting compensation for loss of crops will therefore have to play an important role in the future conservation of elephants of Karnataka."

4. U.S.A.

An Elephant Interest Group has been formed. This Group held its first meeting on June 21, 1977. The EIG is affiliated to the American Society of Mammalogists (Conservation of Land Mammals Committee), and has established contact with both IUCN/SSC elephant specialist groups in order to co-ordinate various activities. The EIG produces a Newsletter entitled 'Elephant'. For further information please contact the editor:

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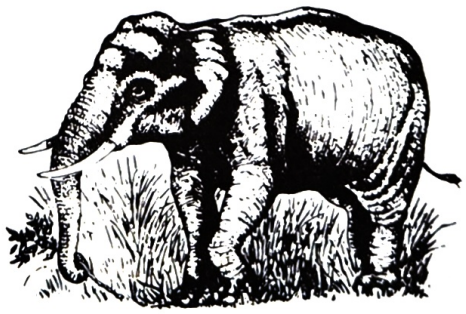

THE WILD ASSES AT THE LITTLE RANN OF KUTCH

Some four or five centuries ago, ships could sail from a small harbour at the little town of Zimzuvada to the Gulf of Kutch, and on to the Arabian Sea. Today this town in north-western Gujarat, India, is situated on the border of a flat desert, which is only flooded for a couple of months every year. This area is called the Little Rann of Kutch.

The Little Rann was formed through siltation of the marine estuary which separated Zimzuvada from the open sea.

When south-western winds blow from July to October, the water of the Arabian Sea gets pushed up, and innundates the Little Rann. After the sea water has retreated, this area becomes extremely dry. Only 5 to 15 inches of rainfall are recorded every year, and the water of those rivers which enter the Little Rann soon disappears into the salty-clay soil. This leaves the area a dry, desert-like plain.

The salt and the dryness, as well as the scourging heat during summer, are the cause of the complete lack of vegetation throughout the area. Only on small hills (originally islands) which are found on the otherwise flat plain, does a sparse vegetation cover occur. Locally these hills or islands are called "bets". The actual "desert" is the plain between these "bets" and the border of the Rann. This border was originally the shoreline of the estuary, and still is the shoreline during the monsoon season. Away from the shoreline the sandy soil of the "mainland" tilts slowly upwards. The vegetation here resembles that at the *bets*.

According to Juan Spillet (1968) the sparse vegetation of the *bets* consists primarily of low scattered trees. mostly *Acacia arabica* and some grasses such as *Aelurops villosus*. Staple grasses along the shores of the mainland include *Cyperus capillaris, Eragrostis cynosuroides, Eragrostis amabilis* and *Andrapogon* spp.

The *bets,* together with the surroundings of the Little Rann, plus the flat areas in between them, form the last habitat of the Indian wild ass *(Equus hemionus khur).* Apparently the range of the Indian wild ass formerly covered much of north-western India, Pakistan and south-eastern Iran. Presently it is restricted to the Little Rann and its surroundings, while occasional sightings are made along the Great Rann of Kutch.

Food availability

During the monsoon season the asses keep to the *bets,* which, during that period provide enough fodder and fresh water to satisfy the needs of the population. Since there is no habitation on these islands, the asses can also find shelter and are quite safe, since it is extremely difficult to reach the *bets* from the mainland as long as the Little Rann is covered with a shallow layer of water which moves with the tides, making the soil soft and treacherous.

After the monsoon, when the Little Rann dries up, the end of the freshwater and fodder supply at the *bets* also approaches, and the asses must look for alternative food supplies. This they can find along the edges of the Rann, and also in the cultivated fields beyond the narrow edge. The narrow edge of the Rann, which is called "Government Wasteland", is planted with *Prosopis juliflora* and *P. spicigera,* introduced tree species from North America.

These trees were planted in a belt primarily to prevent the spread of the desert, but also to improve the soil fertility and to provide a wind-break and firewood. Although this belt of *Prosopis* might be effective along the Thar desert in Rajasthan and northern Gujarat, it certainly has no effect on the Little Rann. The nature of the Rann (as an old estuary) is such that there is no chance of any spreading whatsoever, and as far as this danger was concerned, the planting of *Prosopis* was not necessary. Ironically, the spreading of desert, or more accurately the creation of desert, takes place on the "mainland" side of the *Prosopis*-belt. It is *there* that desertification takes place through bad land use and overgrazing.

Re-examination of the *Prosopis* plantations at present reveals that, although the original goal was not achieved, two very substantial purposes have been fulfilled. Firstly, the forest belt will produce firewood, which is a badly needed commodity in forest-poor Gujarat, and secondly, the trees prevent the area from being used for agriculture, and so preserve it as a graze and browsing area for domestic as well as wild animals.

The wild asses only visit the surrounding areas of the Little Rann under the cover of darkness. They congregate on the outer edges of the desert before night-fall, spend the night in the *Prosopis*-belt and raiding crops beyond the *Prosopis*-belt and retreat to the desert in the early morning. Water is also found near the villages during the night. All day long the asses stay in the hots, open desert of the Little Rann without any protection against the sun, only shielded from view by mirages.

Threats

Most threatening to the wild asses, as it is to most wildlife, is the destruction of its habitat. The asses could easily be cut off from their main food

supply during the dry season. This comes about by the increase in population, and a resultant increase in agriculture. The high number of cattle which make use of the *Prosopis*-belt for grazing is also a factor. According to Acharya (1973) even the *bets* are no longer the wild asses' private domain, since humans and cattle have encroached on these islands for grazing purposes!

Some disturbance could be made by the people who operate salt-wells in the Rann. The extent of these operations, up to now, probably does not significantly restrict the asses in their movements.

The habit of raiding crops will certainly also remain a threat since farmers are growing hostile towards the asses. According to Gee (1963) the asses raid, in order of preference, the following crops: grain, wheat, cotton, millet and jowar. Crop raiding might have increased over the years in relation to a growing use of their suitable fodder by others.

One thing which was obvious about the asses I observed in February 1977, was that they appeared to be in very good condition. This was in great contrast to the poor condition of the cattle in the same area. The difference was also noted by Juan Spillet (1968) when he visited the area in 1966. (See also T. Riney's article elsewhere in this issue of TIGERPAPER).

Although poaching has affected the populations of chinkara *(Gazella gazella)* and blackbuck *(Antilope cervicapra)* much more, it has also definitely affected the population of the wild asses. With the present conflict concerning crop-raiding on the rise, the threat of poaching can certainly not be neglected. During my visit we noted a limping wild ass, while a farmer with a gun was spotted at a not too far distance. Although the forestry officials argued that the farmer had nothing to do with the wild ass, there still might have been a relationship between the limping ass and the gun. Gee (1963) also records limping asses, which he relates to stone-throwing by farmers, chasing the asses off their land. Although I have not heard of any reports of wanton killing from cars, this could easily happen, since it is easy to run the asses down by car on the table flat plain. Fleeing from pursuing vehicles could itself result in exhaustion or even shock.

Diseases also claim their toll, as indicated by Juan Spillet (1968). Some deaths of wild asses in 1958 were confirmed to be a result of surra (a disease caused by the protozoan blood parasite *Trypanosoma evansi*, which is transferred through a blood-sucking arthropod). Further death from surra in 1960 and a report of an epidemic of African Horse Sickness (a virus disease spread by midges of the genus *Culicoides*) in November and December 1961 were the cause of an extensive survey carried out by Gee in 1962. Another epidemic of African Horse Disease might have occurred in October-November 1964, when the Forest Guard in charge of the *Prosopis* plantings saw about 100 dead asses between Jesda and Malvan. However the cause of death was not confirmed.

Since no reports of African Horse Sickness have been reported in India since 1968 (Anon., 1977a), it can consequently be assumed to have been eradicated. Surra however, can be regarded as an endemic disease. Surra was reported among equines as well as bovines in Gujarat state in October 1977 (Anon., 1977b).

Capturing of the wild asses occasionally takes place in order to provide zoos with a breeding stock. The asses are almost certainly sensitive to the shock

Indian Wild Asses at the Little Rann of Kutch. Note the "water" -mirage in the back-ground.

Indian Wild Asses at the Little Rann of Kutch. Note the "shoreline" in the back-ground.

involved in capture. This is probably the reason that two of the four specimens caught in 1975, as well as four of the six specimens caught in 1976 died fairly soon after capture.

Population numbers

Salim Ali (1946) carried out the first estimate of numbers. He arrived at the estimate of between 3000 and 5000 individuals. In his Annual Report for 1953, Dharmakumarsinhji (1954) reports that "At present, the species is well protected", which most likely was an accurate statement since Wynter-Blyth (1956) estimated a total population of about 4000 in 1956 and claimed that groups were then always in sight in the Little Rann north of Dhrangadhra. Between 1956 and 1962 the number suddenly dropped dramatically. In 1962 Gee (1963) estimated the population to consist of 860 individuals in the Little Rann plus 10 along the border of Pakistan and the Great Rann. After comparing his own estimate with those of earlier investigators Gee arrives at the conclusion that the earlier estimates were either too high, or that disease had taken a heavy toll, or that these two factors combined were responsible for the difference in numbers.

The Forestry Department of Gujarat carries out censuses now. Their latest census, which was conducted from 13 April till 17 April 1976, revealed that there were 720 wild asses in the Little Rann. Apart from wild asses all other animals observed were counted. The number of these animals were: Nilgai *(Boselaphus tragocamelus)* 96, wolves *(Canis lupus)* 61, chinkara 191, blackbuck 9 and others 114.

Wild Asses Sanctuary

In order to preserve the wild asses, a Wild Asses Sanctuary was declared on 22 February 1973. This sanctuary consists of the Little Rann of Kutch plus the Government Wasteland surrounding it. The size of the total sanctuary is 4,841 square kilometres. This included 3,569 sq. km. for the Rann plus *bets* and 1,272 sq. km. for the Government Wasteland. One of the provisions made for asses is to have concrete drinking tanks installed in the *Prosopis* belt, to supply water to the asses during the summer months.

Conclusions

It is obvious from the described conditions, that the position of the wild asses is far from favourable. The pressure on its habitat is already considerable and is growing constantly. This has already resulted in the fact that even the *bets* are used for grazing by domestic cattle; however, these *bets* should be the *sanctum sanctorum* of the Sanctuary. Therefore it should be recommended that all grazing on the *bets* be prohibited. Simultaneously, the grazing in the *Prosopis*-belt needs to be regulated. Acharya (1973) already states that the entire *Prosopis*-belt, which is part of the Sanctuary, is "severely overgrazed."

Although the operation of salt winning does not constitute much of a problem yet, it should be kept in mind that through unrestricted expansion, the asses might some day find themselves cut off from their feeding grounds.

The populations of asses and other wild animals has declined over the years to such low numbers that strict law enforcement should be carried out. The possession of firearms within the Sanctuary, as well as the shooting of wild asses outside the protected area should therefore not only be prohibited, but definitely followed up.

Still little is known about the ecology of these wild asses. It is hoped therefore, that more attention will be paid to these interesting animals of this remote corner of India.

JHK.

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OCCURRENCE AND SURVIVAL OF THE WOLF IN THE INDIAN DESERT

by Indra Kumar Sharma

The wolf *(Canis lupus)* has vanished from many parts of Europe and Asia and is also rapidly vanishing from the Indian desert. Its survival chances are bleak unless conservation measures are taken. The occurrence and ecological aspects of the wolf in the Indian desert have not yet been studied.

The wolf is largely a forest dweller but also occurs in the Indian desert in thorn-forest, preying upon hare, gazelle and cattle, and is a serious menace to man. (Prater, 1971) The Gray wolf has been eliminated by man in settled areas in Europe and Asia where it preys upon mice, deer and other small animals. (Walker, 1975)

In 1976, 1977, and 1978, I observed that it is the largest carnivore - at the top of the food-chain pyramid - in the Indian desert. Its occurrence, feeding habits and interactions with local men were studied from March 1974 to November 1977, largely in the Luni-basin where it still occurs in sufficient numbers.

Occurrence

The wolf has been observed in the thick thorny scrub of Kayalana and the hilly areas of Jogitirth. Its populations were estimated at about 8 and 6 individuals respectively. Six wolves were observed at Fitkasni hill and four at Dhingara - Luni ravine. Seven wolves were reported from Kankani-Luni ravine and 4 in the *Prosopis juliflora* thicket of the Gura-Bishnoia area.

This would seem to indicate that the wolf prefers to inhabit the hills and ravine areas, but may also occur in thickets. There is a higher population in the thick scrub-forests on the banks of the Luni river, where it can find enough food of jungle rats *(Tatera indica* and *Meriones hurriane),* hare *(Lepus nigricollis)* as well as sheep and goats brought by shepherds to graze at the grasslands close to the river.

It was observed that in the hills the wolf dwells in deep hollows between rocks. In ravine areas it occupies spaces in or between thickets of *Euphorbia caducifolia* or *Salvadora oleoides.*

Feeding Habits

The wolf preys upon hares, jungle rats, gazelles *(Gazella gazella),* blackbuck *(Antelope cervicapra)* and occasionally will catch partridges *(Francolinus pondicerianus)* and doves *(Streptopelia senegalenis* and *S. decacto).* In areas with a high wolf population, villagers have reported that 20 - 25 sheep were recorded lifted in a month.

Interactions With Man

Local shepherds despise the wolf. They keep a long staff and employ two or three stout dogs to guard their sheep-herds, but the wolf often succeeds in lifting a lamb or a week sheep trailing behind the herd or which has strayed a little. Some shepherds keep a gun to repel the menacing wolves and often succeed in killing them. Others engage Bhils (hunters) for the purpose.

The population of wolves has been found to be decreasing. At Fitkasni the number dropped from 6 to 4 between November 1974 and November 1977. Other areas showed a comparable reduction. The major cause of the decline in numbers is the hunting of the wolf and its young by shepherds.

Cultivation is also developing rapidly in scrub wastelands, particularly near the river basin and this is

depriving the wolf of its usual haunts.

Pet dogs of farmers are serious competitors of the wolf, jointly scaring the wolf away to a distant, remote area and depriving it of its prey.

It should be noted that the wolf has also been a manace to man himself. Lone men have been mauled by wolves and two cases have proved fatal.

Survival and Conservation

As the wolf is a serious threat to sheep and goats, the local people are deadly enemies of the wolf. Thus it has been exterminated in many areas where it once thrived a decade ago and where it has survived it is rapidly vanishing because of human interferences discussed earlier.

This vanishing carnivore would best be preserved in wide, remote sanctuaries having the least interactions with man, who has proved fatal to it.

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INDIAN WILDDOG STUDY

A.J.T. Johnsingh, Assistant Professor of Zoology, has been studying the ecology and behaviour of the Indian wilddog *(Cuon alpinus)* in the Bandipur Tiger Reserve, Karnataka. The study, mainly financed by World Wildlife Fund India and International appeals, was begun in August 1976 and will continue till July 1978. He has gathered many facts about this elusive pack hunter and will be writing an article on wilddogs after completing his field work. He would be very grateful for any information on the Asiatic wilddog outside India.

Please write: A.J.T. Johnsingh, Bandipur, Mysore, S. India.

Wild Dog (Johnsingh).

Note: In several Countries in Asia wild dogs are still shot on sight. This even happens inside National Parks, carried out by Park officials who, by doing so, violate National Park principles. IUCN has already declared the wild dog an endangered species, and it is listed in the Red Data Book *as such.*

Wild dogs form an integral part of the ecosystems in Asia and need protection for that reason. It is hypocritical to extend protection to the tiger and neglect the wild dog (and the wolf for that matter). Perhaps tigers are more spectacular, or to many people they may look more beautiful, but the wild dog is just as intriguing and interesting as the tiger is.

A species should not be protected only because it looks pretty or has a beautiful skin. Most important is that every animal fulfils a role in its habitat and deserves as much protection as any other species. Being a predator, this applies even more strongly to the wild dog.

Therefore, it is heartening to note that people like Mr. Johnsingh and Mr. Sharma are paying so much attention to wild dogs and wolves.
JHK